

An Albino Sculpin from a Cave in the New River Drainage of West Virginia (Pisces: Cottidae)

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ABSTRACT. — An albino Banded sculpin, *Cottus carolinae*, with atypical morphological features, is reported from Buckeye Creek Cave, Greenbrier County, West Virginia. This is the first report of albinism in the genus. One atypical feature of the specimen is presence of a frenum, a structure unknown in any member of the family Cottidae. Other atypical features include enlargement of the cephalic canal pores and fusion of the postmandibular pores, and dorsal spine and pelvic fin ray counts that are unusual for a member of the *C. carolinae* species group. The atypical features are described and compared with those of normally pigmented *C. carolinae*, which also occur in the cave.

INTRODUCTION

A male albino Banded sculpin (Fig. 1), 67 mm standard length (SL), was collected in Buckeye Creek Cave by J. A. Stellmack on 3 September 1967. We are reporting this specimen as the first record of albinism in the genus *Cottus*, family Cottidae. It is somewhat surprising that this condition has not previously been reported for sculpins considering their frequent occurrence in subterranean waters. The specimen is of particular interest since it has several atypical morphological features in addition to the albinistic condition.

Buckeye Creek Cave is located approximately 4 km southwest of Renick, Greenbrier County, West Virginia. The entrance to the cave is in a shallow limestone sink in a hillside alongside a pasture. A small stream 1 to 2 m wide which flows into the cave appears to be a tributary of Spring creek, Greenbrier River drainage. This drainage is developed on limestone and has many subterranean streams. The albino sculpin was collected in the aphotic zone of the cave, approximately 200 m from the entrance. It was sighted and taken in an open area in clear water approximately 15 cm deep over a gravel bottom. At the time of capture the body

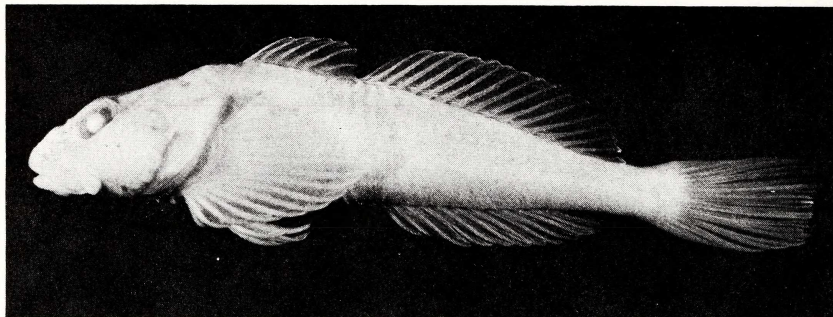


Fig. 1. Albino Banded sculpin, *Cottus carolinae*, (67 mm SL) from Buckeye Creek Cave, Greenbrier County, West Virginia, collected 3 September 1967.

was white to cream colored, without any dark pigment. Eye color was not noted at that time (J. A. Stellmack, pers. comm.).

On 7 August 1970 we visited Buckeye Creek Cave to search for additional specimens of *Cottus*. No albinos were seen, but 48 normally pigmented *Cottus carolinae*, ranging from 18 to 91 mm SL, were collected inside and outside the cave. We found specimens to a distance of 400 m inside the cave, which was as far as we explored.

RESULTS AND DISCUSSION

Other atypical features present in the Buckeye Creek Cave albino include: (1) a frenum; (2) enlargement of the cephalic canal pores and fusion of the postmandibular pores; and (3) dorsal spine and pelvic fin ray counts that are atypical for a member of the *Cottus carolinae* species group (Table 1). The presence of a frenum in the albino sculpin is most unusual. This condition is not known to occur in any other member of the genus *Cottus* or in the family Cottidae.

Enlargement of the cephalic canal pores and fusion of the postmandibular pores may be associated with the albinistic condition, but are more likely results of conditions in the cave environment. McAllister (1968) reported enlarged pores on sculpins from poorly lighted environments, such as deep lakes and muddy water, compared with sculpins in well lighted environments. Fusion of the two postmandibular pores into a single large pore is a condition that rarely occurs in surface dwelling sculpins. Seven of the 20 specimens (29-91 mm SL) of the 48 normally-pigmented specimens taken inside Buckeye Creek Cave and outside around the entrance had the postmandibular pores fused into a single pore.

Table 1. Frequency distribution of numbers of fin rays and lateral line pore counts for *Cottus bairdi* and *C. carolinae* from the New River drainage (Robins 1954); a recent collection of *C. carolinae* from Buckeye Creek Cave (New River drainage); and an albino *C. carolinae* from Buckeye Creek Cave.

		Dorsal spines						
		6	7	8	N	\bar{X}		
<i>Cottus bairdi</i>								
	New River drainage		70	64	134	7.48		
<i>Cottus carolinae</i>								
	New River drainage		27	69	96	7.72		
	Buckeye Creek Cave		28	2	30	7.07		
	Albino	1			1	6.00		
		Dorsal rays						
		15	16	17	18	N	\bar{X}	
<i>Cottus bairdi</i>								
	New River drainage	11	68	55	2	136	16.35	
<i>Cottus carolinae</i>								
	New River drainage		46	50	1	97	16.54	
	Buckeye Creek Cave	3	25	2		30	15.97	
	Albino		1			1	16.00	
		Dorsal spines plus rays						
		22	23	24	25	26	N	\bar{X}
<i>Cottus bairdi</i>								
	New River drainage	7	32	65	27		131	23.86
<i>Cottus carolinae</i>								
	New River drainage		12	36	42	1	91	24.35
	Buckeye Creek Cave	3	23	4			39	23.03
	Albino	1					1	22.00
		Anal rays						
		11	12	13	14	N	\bar{X}	
<i>Cottus bairdi</i>								
	New River drainage	6	75	52	2	135	12.37	
<i>Cottus carolinae</i>								
	New River drainage	1	36	59	1	97	12.62	
	Buckeye Creek Cave	2	13	14		29	12.41	
	Albino		1			1	12.00	

Table 1 (Continued)

	Pectoral rays (left and right fins)							N	\bar{X}	
	13	14	15	16	17	18				
<i>Cottus bairdi</i>										
New River drainage	11	96	185	20				312	14.69	
<i>Cottus carolinae</i>										
New River drainage			3	47	129	17		196	16.88	
Buckeye Creek Cave				35	25			60	16.42	
Albino			1	1				2	15.50	
	Pelvic rays (left and right fins)				N	\bar{X}				
	3	4								
<i>Cottus bairdi</i>										
New River drainage	37		235		272	3.86				
<i>Cottus carolinae</i>										
New River drainage				182	182	4.00				
Buckeye Creek Cave				60	60	4.00				
Albino	2				2	3.00				
	Lateral line pores									
	18	19	20	21	22	23	24	25	26	
<i>Cottus bairdi</i>										
New River drainage	1	6	8	10	18	25	14	11	5	
<i>Cottus carolinae</i>										
New River drainage							2	6	7	
Buckeye Creek Cave							2	3	5	
Albino								1		
	Lateral line pores									
	27	28	29	30	31	32	33	N	\bar{X}	
<i>Cottus bairdi</i>										
New River drainage								100	22.68	
<i>Cottus carolinae</i>										
New River drainage	21	38	8	2	2	8	3	97	28.04	
Buckeye Creek Cave	5	1						16		
Albino								1	25.00	

Two atypical fin ray counts were observed in the albino. The low dorsal spine count (6) is unusual for species of the *Cottus bairdi* or *C. carolinae* complex. Three pelvic rays in the albino are atypical for the *C. carolinae* complex, but is not unusual for, and can be characteristic of, some species of the *C. bairdi* complex. All fin rays except caudal rays were unbranched, which is the usual condition in the genus. Relyea and Sutton (1973) reported a cave population of Yellow bullheads, *Ictalurus natalis*, in which some individuals had no pelvic fins while others had a deformed caudal fin and a deformed, reduced or absent adipose fin. These bullheads were somewhat depigmented but not albinistic.

The preopercular armature of the albino sculpin consists of one moderate-to-large upturned spine with two smaller spines below it. The dentition is well developed, with the palatine patch almost touching the vomerine patch. In length the palatine patch is about equal to the width of the vomerine patch. The preopercular armature and dentition are typical for *C. carolinae*.

Body proportions of the albino fall within the range of variation of both *C. carolinae* and *C. bairdi* as reported by Robins (1954). Body proportions, expressed as thousandths of standard length, are: head length/346; eye length/82; lateral line length/845; body depth/224; caudal peduncle depth/82; caudal fin length/228; pelvic fin length/187; pectoral fin length/262.

There have been numerous reports of albinism in fishes (see Dawson 1964, 1966, 1971), most of which reported the albinistic condition but did not note any unusual or atypical morphological features associated with albinism. Bridges and Limbach (1972) demonstrated through breeding tests that albinism in Rainbow trout, *Salmo gairdneri*, is a simple autosomal recessive character. They found no significant pleiotropic effect of the mutant gene.

Speciation can be expected to be greater in the folded limestones of the Appalachians than in the flat-bedded limestones of, say, the Interior Low Plateaus because dispersal routes are more likely to be disrupted and populations isolated. Examples of several invertebrates which evolved in isolated cave systems in the Greenbrier Valley of West Virginia were mentioned by Culver et al. (1974). Besharse and Holsinger (1977) described a new species of subterranean salamander from a cave in this valley. We recognize that this albino may represent a "stray" from a true cave-adapted population which is specifically distinct. However, the atypical features of the specimen, i.e., presence of a frenum, unusual dorsal and pelvic fin ray counts, and enlarged cephalic canal pores, may be environmentally induced. We feel that the assignment of a specific name is

not appropriate at this time, and hope that this report will stimulate speleologists and ichthyologists to search for additional albino *Cottus* in the caves of this area.

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LITERATURE CITED

- Besharse, Joseph C., and J. R. Holsinger, 1977. *Gyrinophilus subterraneus*, a new troglotic salamander from southern West Virginia. *Copeia* 1977 (4):624-634.
- Bridges, W. R., and B. Limbach. 1972. Inheritance of albinism in rainbow trout. *Heredity* 63(3):152-153.
- Culver, David, J. R. Holsinger, and R. Baroody. 1972. Toward a predictive cave biogeography: the Greenbrier Valley as a case study. *Evolution* 27(4):689-695.
- Dawson, C. E. 1964. A bibliography of anomalies of fishes. *Gulf Res. Rep.* 1(6):308-399.
- . 1966. A bibliography of anomalies of fishes, supplement 1. *Gulf Res. Rep.* 2(2):169-176.
- . 1971. A bibliography of anomalies of fishes, supplement 2. *Gulf Res. Rep.* 3(2):215-239.
- McAllister, Don E. 1968. Mandibular pore pattern in the sculpin family Cottidae. *Natl. Mus. Can. Bull.* 223(6):58-69.
- Relyea, Kenneth and B. Sutton. 1973. Cave dwelling yellow bullheads in Florida. *Fla. Sci* 36(1):31-34.
- Robins, C. Richard. 1954. A taxonomic revision of the *Cottus bairdi* and *Cottus carolinae* species groups in eastern North America. (Pisces, Cottidae). Ph.D. Dissert., Cornell Univ., Ithaca. 248 pp.

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